

8-11 GUARDRAIL

8-11.1 Description

This Work consists of constructing, modifying, removing, and resetting guardrail and anchors of the kind and type specified in accordance with the Plans, these Specifications, and the Standard Plans in conformity with the lines and grades as staked.

8-11.2 Materials

Materials shall meet the requirements of the following sections:

Beam Guardrail	9-16.3
Rail Element	9-16.3(1)
Posts and Blocks	9-16.3(2)
Galvanizing	9-16.3(3)
Hardware	9-16.3(4)
Anchors	9-16.3(5)
Weathering Steel Beam Guardrail	9-16.8

8-11.3 Construction Requirements

8-11.3(1) Beam Guardrail

8-11.3(1)A Erection of Posts

The posts shall be set to the true line and grade of the Highway and spaced as shown in the Plans. When the Plans require that the ends of a section of guardrail be curved outward or downward, the posts shall be set to accommodate the curve. End treatment shall be in accordance with the appropriate Standard Plans or as shown in the Plans.

The length of post installed shall be as shown in the Standard Plans unless long posts are indicated. The length of the posts for beam guardrail with long posts shall be as shown in the Plans.

Posts may be placed in dug or drilled holes. Ramming or driving will be permitted only if approved by the Engineer and if no damage to the pavement, Shoulders, and adjacent slopes results there from.

In broken rock embankments, the pre-punching of holes will be permitted only prior to final Shoulder or median compaction, surfacing, and paving.

The posts shall be protected from traffic at all times by attaching the rail elements or by a method approved by the Engineer.

8-11.3(1)B Vacant

8-11.3(1)C Erection of Rail

All metal work shall be fabricated in the shop. No punching, cutting, or welding shall be done in the field, except that holes necessary when additional posts are required or for special details in exceptional cases may be drilled in the field when approved by the Engineer. The rail shall be erected so that the bolts at expansion joints will be located at the centers of the slotted holes. Except in Weathering Steel Beam Guardrail, all holes shall be painted with 2 coats of galvanizing repair paint Formula A-9-73 meeting the requirements of Section 9-08.2.

Rail plates shall be assembled with the splice joints lapping in the direction of the traffic.

When nested W-beam or thrie beam is specified, 2 sections of guardrail, 1 set inside of the other shall be installed. The inside and outside rail elements shall not be staggered.

Galvanized and weathering steel rail plates shall be fastened to the posts with galvanized bolts, washers, and nuts of the size and kind shown in the Plans.

All bolts, except where otherwise required at expansion joints, shall be drawn tight. Bolts through expansion joints shall be drawn up as tight as possible without being tight enough to prevent the rail elements from sliding past one another longitudinally. Bolts shall be sufficiently long to extend at least 1/4-inch beyond the nuts. Except where required for adjustments, bolts shall not extend more than 1/2-inch beyond the nuts.

After complete installation of weathering steel beam guardrail, the Contractor shall wash the rail with clean water under high pressure. If the rail is contaminated by oil or grease, sandblasting shall be used as necessary to clean the rail.

8-11.3(1)D Terminal and Anchor Installation

All excavation and backfilling required for installation of anchors shall be performed in accordance with Section 2-09, except that the costs thereof shall be incidental to and included in the unit Contract price for the type of anchor installed.

Bolts shall be tightened to the tension specified. The anchor cable shall be tightened sufficiently to eliminate all slack. When tightening, the anchor cable shall be restrained to prevent twisting of the cable.

When foundation tubes used with the Wood Breakaway Post are driven, they shall be driven prior to installing the wood post.

Type 2 concrete anchors may either be precast or cast-in-place at the option of the Contractor.

Assembly and installation of Beam Guardrail Flared Terminals and Beam Guardrail Non-flared Terminals shall be supervised at all times by a manufacturer's representative, or an installer who has been trained and certified by the manufacturer. A copy of the installer's certification shall be provided to the Engineer prior to installation. Assembly and installation shall be in accordance with the manufacturer's recommendations.

8-11.3(1)E Plans

The Contractor shall submit for approval of the Engineer such additional detailed plans and shop drawings of rail punching, fittings, and assemblies as may be required by the Engineer.

8-11.3(2) Guardrail Construction Exposed to Traffic

Any section of beam guardrail that is removed for modification shall be back in place within 5-calendar days of the date the guardrail is removed.

The Contractor's operations shall be conducted in such a manner that fixed objects and beam guardrail posts shall be protected from traffic at all times by attachment of the rail elements and all associated hardware or by a method approved by the Engineer.

At the end of each day, guardrail sections having an exposed end toward oncoming traffic shall have a Type G terminal end section bolted securely in place.

8-11.3(3) Access Control Gates

Access control gates shall be placed to line and grade as shown in the Plans or as staked. After the posts have been set, the holes shall be backfilled with suitable material and the material thoroughly tamped.

8-11.3(4) Removing Guardrail and Guardrail Anchor

Removal of the various types of guardrail shall include removal of the rail, cable elements, hardware, and posts, including transition sections, expansion sections and terminal sections. Removal of the various types of guardrail anchors shall include removal of the anchor assembly in its entirety, including concrete bases, rebar, and steel tubes and any other appurtenances in the anchor assembly. All holes resulting from the removal of the guardrail posts and anchors shall be backfilled with granular material in layers no more than 6-inches thick and compacted to a density similar to that of the adjacent material. The removed guardrail items shall become the property of the Contractor.

8-11.3(5) Raising Guardrail

For raising guardrail anchors and raising guardrail terminals, the existing guardrail posts shall be raised to attain the guardrail height shown in the Plans, measured from the top of the rail to the finished Shoulder surface. The material around each post shall be tamped to prevent settlement of the raised post.

For raising all other guardrail, the existing guardrail posts shall not be raised to attain the new mounting height. The existing rail elements and blocks shall be removed from the guardrail post. The Contractor shall field drill new $\frac{3}{4}$ -inch diameter holes in the existing posts to accommodate the $\frac{5}{8}$ -inch diameter button head bolts. When existing guardrail posts are galvanized steel, the new drill holes shall be painted with 2 coats of galvanizing repair paint, Formula A-9-73, meeting the requirements of Section 9-08.2. The Contractor shall then reinstall the guardrail block and rail element at the new mounting height shown in the Plans, measured from the top of the rail to the finished Shoulder surface. The new position of the top of the block shall not be more than 4-inches above the top of the guardrail post.

The Contractor shall remove and replace any existing guardrail posts and blocks that are not suited for re-use, as staked by the Engineer. The void caused by the removal of the post shall be backfilled and compacted. The Contractor shall then furnish and install a new guardrail post to provide the necessary mounting height.

8-11.4 Measurement

Measurement of beam guardrail and beam guardrail with long posts will be by the linear foot measured along the line of the completed guardrail, including expansion section, and will also include the end section for F connections.

Measurement of beam guardrail transition sections will be per each for the type of transition section installed. End sections, except for F connections, will be considered part of the transition section and will be included in the measurement of the transition section.

Measurement of beam guardrail _____ terminal and beam guardrail buried terminal Type 1 will be per each for the completed terminal.

Measurement of beam guardrail buried terminal Type 2 will be per linear foot for the completed terminal.

Measurement of beam guardrail placement-25-foot span will be per each for the completed span.

Measurement of beam guardrail anchors of the type specified will be per each for the completed anchor, including the attachment of the anchor to the guardrail.

Access control gates will be measured per each.

Measurement of removal of guardrail will be by the linear foot measured along the line of guardrail removed including transition sections, expansion sections, and terminal sections.

Measurement of removal of guardrail anchors will be per each.

Measurement of raising beam guardrail and removing and resetting beam guardrail will be by the linear foot measured along the line of guardrail actually raised or removed and reset. This will include transition sections, expansion sections, anchors, and terminal sections.

Measurement of beam guardrail post used for raising beam guardrail will be per each.

Measurement of beam guardrail blocks used for raising beam guardrail will be per each.

8-11.5 Payment

Payment will be made in accordance with Section 1-04.1, for each of the following Bid items that are included in the Proposal:

“Beam Guardrail Type ____”, per linear foot.

“Beam Guardrail Type 1- ____ Ft. Long Post”, per linear foot.

“Beam Guardrail Type 31- ____ Ft. Long Post”, per linear foot.

“Weathering St. Beam Guardrail Type ____”, per linear foot.

The unit Contract price per linear foot for “Beam Guardrail Type ____”, “Beam Guardrail Type 1- ____ Ft. Long Post”, “Beam Guardrail Type 31- ____ Ft. Long Post”, or “Weathering St. Beam Guardrail Type ____” shall include all CRT posts, additional rail elements when nested rail is required, and connection to concrete masonry Structures.

“Beam Guardrail Anchor Type ____”, per each.

“Beam Guardrail Transition Section Type ____”, per each.

The unit Contract price per each for “Beam Guardrail Transition Section Type ____” shall include posts, end sections, and connection to masonry Structures.

“Beam Guardrail ____ Terminal”, per each.

“Beam Guardrail Buried Terminal Type 1”, per each.

“Beam Guardrail Buried Terminal Type 2”, per linear foot.

The unit Contract price for “Beam Guardrail ____ Terminal”, “Beam Guardrail Buried Terminal Type 1” and “Beam Guardrail Buried Terminal Type 2” shall include the posts, rail, end section, and anchor.

“Beam Guardrail Placement - 25’ Span”, per each.

The unit Contract price per each for “Beam Guardrail Placement - 25’ Span”, shall include all CRT posts, Type 1 guardrail posts and blocks and all nested w-beam rail elements.

“Access Control Gate”, per each.

“Removing and Resetting Beam Guardrail”, per linear foot.

“Raising Existing Beam Guardrail”, per linear foot.

The unit Contract price per linear foot for “Raising Existing Beam Guardrail”, per linear foot shall be full pay for raising existing posts, compacting existing material, field drilling existing posts, raising guardrail and blocks, furnishing and installing new bolts, painting galvanized steel posts with galvanizing paint, and replacing any hardware that is damaged or missing but is required to provide a complete installation.

“Removing Guardrail”, per linear foot.

“Removing Guardrail Anchor”, per each.

“Beam Guardrail Post”, per each.

The unit Contract price per each for “Beam Guardrail Post” shall include furnishing and installing the new post, removal and disposal of the existing post, and backfilling and compacting the void created by the post removal.

“Beam Guardrail Block”, per each.

The unit Contract price per each for “Beam Guardrail Block” shall include furnishing and installing the new block, and removal and disposal of the existing block.